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Abstract

In this article we investigate whether, in Italy, family background is significantly related to graduation from programs with higher occupational pay-offs. In particular, we assess whether changes in this relationship occurred in a period characterized by rapid higher education expansion and important institutional and labor market transformations. We measure fields of study (FoS) as a categorical variable, as well as a quantitative variable, to capture the potential occupational value of academic subjects. We use five cross-sectional waves of the Italian Graduates Employment Survey (1998-2011) with more than 100,000 cases. Applying multinomial logistic regression, we found that individuals with highly educated parents were more likely to obtain a degree in subjects leading to professional jobs (law and medicine) and the relative differences with graduates from lower socio-economic background grew over time. Results from fractional logit models indicate an increased association between social background and graduation from FoS leading more often to the upper class and from fields leading to less uncertain occupational rewards. While on the first outcome, we detected a continuous increase over time, looking at the second we found a particularly strong growth among the post-Bologna cohorts. Unlike what was found in the US, most of the differences across social origins with respect to destinations associated with FoS were not accounted by previous school track and marks in high school.

Keywords	fields of study; social inequalities; educational expansion; higher education; graduates; Italy
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Dear Editor,

We would like to submit our work entitled "Social background, fields of study and occupational rewards. Changing relationships in an expanding higher education system" to *Research in Social Stratification and Mobility*, which we selected for its international reputation and rigor. The article analyzes horizontal forms of social stratification in the Italian higher education system, and how they changed in a recent period characterized by important university reforms (restructuring of degree programmes and changes in the educational supply) and occupational transformations (flexibilization of job contracts and increased competition in the transition to the labor market). We believe our work can be considered a valuable contribution at the intersection of different research streams, such as educational inequalities, social mobility and early occupational outcomes. Moreover, the article could be of interest for scholars of higher education, in which increasing attention is paid to differentiation between academic disciplines, courses, institutions.

This work was partially inspired by an earlier article on the US case (Davies and Guppy 1997). Our article provides an update and extension in several respects: i) discussing also the literature review on European studies, ii) developing a theoretical framework that allows making predictions on changes over time in horizontal inequalities in higher education; iii) analyzing how horizontal inequalities changed over cohorts of graduates who experienced very different institutional contexts; iv) considering the labor market value of fields of study in terms of access to the upper class; v) considering also the potential uncertainty around the expected returns associated with the FoS; vi) using an appropriate and not sso well known methodology to model the outcomes of our interest (fractional logit models).

For all these reasons, we hope that the article could be of interest of RSSM.

Sincerely,

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Social background, fields of study and occupational rewards. Changing relationships in an expanding higher education system

1   Introduction

In the second half of the twentieth century, a great expansion of higher education occurred, with a remarkable growth of access to tertiary education and in the number of graduates in the labor market. The United States was among the precursors of this trend, followed by other Anglophone and European countries. Furthermore, the social gradient in obtaining a tertiary degree also diminished over time in several countries (Koucký, Bartušek, and Kovařovic 2007). Nevertheless, these trends have not necessarily translated into a reduction of social inequalities in terms of occupational attainment, because lower-class students might have had access to degree programs with weaker labor market value than upper-class children had (Shavit, Arum, and Gamoran 2007; van de Werfhorst and Luijkx 2014). As suggested by Davies and Guppy (1997: 1418), educational competition hardly ends when a student enters higher education, mainly because the various types of available credentials are not equally valued by students and employers.

In line with this consideration, the main goal of our paper is to investigate whether, in Italy, family background is related to graduation from programs with higher occupational pay-offs and whether changes in this relationship have occurred. There are several reasons why Italy can be considered an attention-grabbing case study to examine horizontal stratification and inequalities in higher education. The growth in the proportion of graduates was not followed by an upgrading of the occupational structure (Barone 2012) and was accompanied by an increasingly precarious condition of the youth labor market (Barbieri and Scherer 2009). This seems to have resulted in stronger competition experienced by graduates on entry to the labor market and to credential inflation of university degrees from the 1990s onwards (Triventi et al. 2016).

Moreover, an important university reform within the 'Bologna Process' framework was introduced at the beginning of the 2000s, shortening the length of degree programs and changing the perception of the opportunity costs to enter university. The reform widened access to university for lower-class children, thus reducing social inequality in relation to enrollment among young high school leavers (Cappellari and Lucifora 2009), at least in the short term and for particular categories of students (Argentin and Triventi 2011). This provides an interesting setting in which to test predictions derived from the effectively maintained inequality thesis (Lucas 2001; see section 4).

Finally, since for long time in the Italian higher education there have been mainly long-degree courses and low institutional differentiation, the main dimension of stratification is represented by fields of study (FoS, hereafter), which are characterized by different selectivity, prestige, workload, and connections with the labor market. Therefore it is interesting to

examine whether and to what extent FoS constitutes a way of reproducing social inequality related to family background in a context with limited stratification among universities.

With this paper we aim to provide three main advancements compared to existing studies. Firstly, we investigate changes in social inequality over cohorts of graduates who are characterized by having studied under clearly different institutional conditions. Secondly, we elaborate a set of hypotheses explicitly devoted to predicting possible changes over time in the nexus between social background and FoS. Thirdly, our empirical strategy allows us to measure the potential occupational value of a FoS not only in terms of average returns but also in terms of their variability, capturing the uncertainty associated with the potential labor market rewards after graduation.

This article is organized as follows: in the next section we present the main features of the Italian higher education system. In the third section, we review existing research results, while in the fourth we discuss our theoretical framework, deriving a number of hypotheses regarding the expected results. Then, we present our research strategy (section 5) and the data, variables and methods (section 6). In the seventh section we discuss the empirical results and in the last one the conclusions are drawn.

2   The Italian higher education system: a brief description

Throughout the twentieth century, the Italian higher education system was a 'unitary' or undifferentiated system (Shavit, Arum, and Gamoran 2007). All the institutions had the status of a university with both teaching and research functions, and most universities were public. Only one type of degree was available, with programs lasting four years with the exception of architecture, engineering and chemistry (five years), and medicine (six years). From the end of the 1960s everyone who had successfully completed any five-year high-school program, irrespective of the specific track (academic, technical or vocational) followed, was allowed to enroll in any university program.

Within the broader European framework of the 'Bologna Process', in 2001 a three-level structure has been implemented, comprising a first-level degree (*Laurea triennale*, three years), a second-level degree/master (*Laurea magistrale*, two years), followed by doctoral studies (*Dottorato di ricerca*, three years). Moreover, the old system of examinations held every year or semester has been replaced by the introduction of the European Credit Transfer System (ECTS). At the same time a reduction in the time and effort required to obtain a university degree was observed (Boero and Staffolani 2007). These changes were followed by an increase in enrollments and graduates (see Figure 1). Yet, the high proportion of dropouts, which traditionally affected Italian higher education, only decreased slightly and then resurged in recent years (Argentin and Triventi 2011).

[Figure 1, about here]

The implementation of the 'Bologna Process' has been accompanied by a dramatic growth in the number and variety of bachelor and master's programs, which was driven more by the

interest of academic groups and less by labor market demands. Coupled with a high level of course fragmentation and lack of professional university guidance services, this has led to an increased complexity of students' choice of the academic pathways to be pursued after high school.

Nowadays, most programs have free access, while in a small number of cases entrance is restricted to students who have passed an admission test. Entry restrictions are imposed by the Italian Ministry of Education at national level for some key programs (architecture, veterinary, medicine and health-related programs), while universities are allowed to decide autonomously whether or not to establish entry tests for each specific program.

Compared to other industrialized countries, tuition fees used to be generally low. However, after funding cuts and a slow process of decentralization of power from the state to universities, fees have sharply increased in recent years[1]. Only a small proportion of students receive a grant, which only covers part of the cost of studies (but not living costs).

3   Existing research results

From the viewpoint of social stratification, FoS can be a vehicle of social inequality reproduction in the labor market if, at the same time, i) social background is significantly and positively associated with FoS, and ii) FoS are differently rewarded in the labor market. Starting with the latter case, there is a consolidated corpus of research showing that graduates from different FoS have heterogeneous occupational returns, both in the US (Daymont and Andrisani 1984; James et al. 1989) and in Europe (van de Werfhorst, 2004; Reimer, Noelke, and Kucel 2008; Chevalier 2011). For Italy, it has been shown that graduates in the 'hard' sciences obtain better rewarded occupations in terms of earnings and occupational status, and are less likely to be unemployed or overeducated compared to graduates in the 'soft' social sciences and humanities (Ballarino and Bratti 2009).

Research on the relationship between social origin and FoS has usually found that upper-class children are more likely to choose the more prestigious and remunerative FoS, even though the association is often weak. In the United States, Davies and Guppy (1997) found that socio-economic factors do not affect the probability of entry into lucrative fields net of other background factors, but social background affects entrance into selective colleges and lucrative fields within selective colleges. Furthermore, academic ability is an important predictor of all outcomes considered. Leppel, Williams and Waldauer (2001) show that males with a higher socioeconomic background are more likely to enroll in a business program, but this does not hold for women. Goyette and Mullen (2006) found that low-SES students were more likely to choose vocational majors and high-SES students to opt more frequently for art and science majors, even after other factors like tested proficiency, college characteristics, expectations, and work values had been considered.

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[1] For instance, according to MIUR (Italian Ministry of Education) data, from 2001 and 2007 average tuition fees per student increased by 41% in public universities (from 596 to 842 Euros) and by 29% in private institutions (from 2,377 to 3,078 Euros).

In the Netherlands, van de Werfhorst and Kraaykamp (2001) found that children from the economic elites were more likely to enter remunerative FoS, whereas children from the cultural elites were more likely to enter academically prestigious fields. There is also evidence that children from the lower classes prefer technical fields, like engineering, economics and medical-care programs. Several studies on European countries show that students from tertiary educated parents were more likely to choose medicine and law over humanities and social sciences: this is the case in Germany (Reimer and Pollak 2010), Finland (Kivinen and Rinne 1991), Sweden (Berggren 2008), France (Deer 2005) and Italy (Pisati 2002). A recent study by Triventi (2013) found that parental education is positively related to graduation from prestigious FoS in Italy, the UK and the Northern European countries, but not in Central-Western countries. There is also evidence that higher achievement at high school leads to a preference for all other FoS over humanities and social sciences.

Unfortunately, most studies have examined the association between social background and FoS using data on single cohorts, without inspecting in detail changes over time. Among the few works that have been able to address this issue, there are those of Duru-Bellat, Kieffer, and Reimer (2008) and Reimer and Pollak (2010). They found no major changes in social inequalities in terms of FoS destination in Germany and France in the 1980s and 1990s. Oppositely, the study by Zarifa (2012) showed a declining effect of social background on graduation from remunerative FoS in Canada between 1995 and 2000, but no effects in the US. We aim to expand this literature looking in more detail at changes over time in a different institutional context, elaborating theoretically grounded hypotheses.

4   Theoretical framework and hypotheses

Several theories suggest that upper-class children may have a higher propensity to enroll in the better rewarded degree subjects. According to rational action theory (Boudon 1974; Breen and Goldthorpe 1997), lower-class children may opt for the shorter and less demanding programs, because by this way they diminish their risk of dropout or delay in graduation. On the contrary, the choice of the FoS for upper-class children could be crucial in avoiding downward social mobility in relation to occupational attainment. If this holds true, students from socio-economically advantaged families would be more likely to choose those fields with higher value in the labor market. According to Bourdieu and Passeron (1990) and Bourdieu (1979), the choice of degree subject is also affected by knowledge about higher education: since upper-class children more often have highly educated parents, they also have more information about the prestige and economic pay-offs associated with different FoS and, so, they have the appropriate 'know-how' to master the enrollment choice and to 'navigate' the higher education landscape. In the Italian case, given the rise over recent years of higher education participation and the crucial relevance of the subject studied to subsequent occupational career, *we expect a significant and positive effect of social background on graduation in degree subjects with higher (potential) occupational returns* (hypothesis 1).

Nevertheless, other arguments suggest that family background may be of minor importance in the choice of FoS. According to the life–course hypothesis (Müller and Karle 1993), young

people become increasingly independent from their parents as they grow older and they can have more autonomy in terms of choice when entering higher education. The differential social selection argument (Mare 1981) sustains that the effect of family background declines at later educational stages because the process of social selection has already occurred in previous educational transitions. Only motivated and able lower-class students decide to enroll at university and they are relatively similar in terms of these unobserved characteristics to upper class students who enter university. In the Italian case, there is still a strong social gradient in the transition to university in recent cohorts (Argentin and Triventi 2011; Ballarino and Panichella 2016) and students from lower backgrounds are also more likely to dropout from higher education compared to those from advantaged backgrounds (Triventi and Trivellato 2009), thereby making the population of graduates with lower background more positively selected on unobserved traits (motivations, ability, perseveration, etc). This induces us to expect *that the conditional association between social origin and field of graduation is at best moderate in Italy* (hypothesis 2).

In the Italian case, given the rise in participation in higher education over recent years and the crucial relevance of the subject studied to subsequent occupational career, *we expect a significant and positive effect of social background on graduation in degree subjects with higher (potential) occupational returns* (hypothesis 1).

Following previous studies on the US case (Hearn 1984; 1991), we are not only interested in the 'total effect' of social background, but also in its 'direct effect', once previous school achievement is accounted for. In the Italian case two elements should be taken into account in this respect: final mark and tracking of upper secondary education. Final mark can be considered as a proxy of individual scholastic achievement and it is therefore intended to measure the role of academic ability in the subsequent higher education pathways. Since some of the FoS with higher pay-offs are also more demanding and require a selective test to be passed before entrance, one might think that a large part of the putative advantage of high background children in graduating from remunerative programs is due to their superior school achievement. A second important variable is the type of high school attended,[2] because in Italy students are tracked from the ninth grade onwards. Given that tracking varies widely in standards, curricula, academic orientation and teacher quality (Gambetta 1987), and allocation to tracks is socially stratified (Contini and Scagni 2011; Panichella and Triventi 2014; Ballarino and Panichella 2016), a large part of the social background differentials in graduating from better rewarded fields may have already been produced as a result of the crucial choice of taking the academic track rather than attending technical/vocational schools. As a consequence, *we expect that a conspicuous part of the differences across social backgrounds will be accounted for by previous school track and marks* (hypothesis 3).

One key aim of our research is to establish how the association between social background and FoS has changed in the last decade. The expansion of upper-secondary and tertiary education in Italy has reduced the selectivity of higher education and increased the

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[2] It must be noted that in Italy the independent/private school sector is not very developed when compared to other countries (such as the US and UK), and there is no evidence that Italian state/public schools students are, all other things being equal, disadvantaged in the transition to university or in access to the labor market.

heterogeneity of graduates in terms of unmeasured ability and aspirations. Moreover, when a larger number of students attend higher education, possession of a tertiary degree may no longer be sufficient to ensure the best occupational positions will be detained, since employers may decide to consider additional 'signals', such as FoS (Gerber and Cheung 2008) and the type of institution attended at secondary or tertiary level (Macmillan, Tyler, and Vignoles 2014). Highly educated families are particularly concerned about this issue because, since a greater number of people can acquire a higher education degree, this qualification may be no longer sufficient to guarantee a high–ranked social position and to avoid downward mobility (Breen and Goldthorpe 1997). Thus it is reasonable to think that such families would try to maintain their offspring's advantages by adopting strategic choices in the school system, as suggested by the effectively maintained inequality thesis (Lucas 2001). According to this argument, when an education level is attended by a relatively small share of people, the socioeconomically advantaged use their advantages to secure that level of education. Once a given education level becomes widely attended, they seek the qualitative differences in that stage of education and use their advantages to secure quantitatively similar amounts of qualitatively better schooling. When a large share of individuals enters higher education, high SES families will choose the best educational options within this level for their children in order to maintain their relative advantages. In the Italian context, this process could have been exacerbated by the increased 'flexibilization' of the youth labor market, which made more difficult the early occupational careers of recent graduates (Barbieri and Scherer 2009). Considering that in the Italian educational system the prestige of the higher education institution is not a major driver of students' choices, *we therefore expect an increase over time in the association between social background and graduation from remunerative FoS* (hypothesis 4).

However, we could also expect non-linear variations in horizontal inequalities over time. Indeed, the enrollments growth occurred especially after the introduction of the new degree structure and, since the proportion of drop-outs also slightly decreased after the Bologna Process, an increase in the number of graduates entering the labor market took place between the 2004 and 2007. A second reason to expect a growth in horizontal inequalities after the university reform is due to the increased complexity in the choice of academic discipline brought about by the proliferation of degree programs. In many cases, the promotion of such 'new' degree programs followed strategic marketing rules, such as the presentation of plans of study with 'appealing titles' and overly optimistic assessments of the potential occupational destinations related to these degrees. In this context, in line with Bourdieu's (1979) argument, it is likely that students from highly educated families can better manage the decisions required by the increasingly tangled university degrees supply. Following these arguments, we therefore anticipate that *the increase of inequalities should be more pronounced between the cohort of graduates who were educated under the 'old system' and those under the 'new system' following the Bologna Process* (hypothesis 5).

5 Research design

5.1 Analytical design

We examined our research questions using a three-step empirical strategy. In the first step, we analyzed FoS as a discrete categorical variable, employing a theoretically oriented grouping of degree programs that took into consideration previous research (e.g. Bratti 2006; Duru-Bellat, Kieffer, and Reimer 2008; Ballarino and Bratti 2009; Reimer and Pollack 2009) and the specific Italian institutional context (Pisati 2002; Ballarino 2006). In the second part, we followed Lyons (1971) and Treiman and Terrell (1975), who proposed an effect-proportional scale of education based on the average occupational attainment of individuals for each qualification. The procedure involves a computation of the mean of the outcome variable of interest for each category of the variable to be scaled (FoS in our case) and then assigning the mean scores as scale values. In our work, similar to that proposed by Davis and Guppy (1997) and Wilson and Lovin (1983), we assigned each FoS an estimate of its expected labor market value in order to create a hierarchical classification of degree subjects. It is important to stress that focusing on graduation from the most remunerative FoS did not assume either that all individuals pursue the most lucrative studies, or that lucrative logic was at the base of students' choice of degree subjects (Zarifa 2012). It simply allowed us to rank academic disciplines on the basis of an external criterion (e.g. labor market potential value) which is central to social stratification processes and to analyze the relationship with social background in a parsimonious way.

Compared to existing studies, which looked at expected earnings (Davies and Guppy 1997; Zarifa 2012),[3] we measured the occupational value of FoS in terms of access to an upper-class position. The rationale of using such an indicator was three-fold. First of all, it has been argued that social class is a better indicator of occupational attainment compared to income or earnings, because it is less volatile and is strongly associated with key indicators of socio-economic advantage as well, such as wages, earnings security, and fringe benefits gained from employment (Goldthorpe 2013). Furthermore, since social class is related to longer-term earnings and status prospects, it is better suited to an investigation of access to long-term advantages in the labor market compared to early wages, which instead reflect short-term outcomes. This was particularly relevant in our context because some degree subjects have postponed high returns, meaning lower economic returns in the short-run but a steep growth curve over the course of a career. Finally, social class attained may be less affected by measurement error, especially in Italy, a country characterized by a rather large share of self-employed and some reluctance to declare earnings in surveys.

The third step, which represents a development of the findings reported in existing literature, consisted of examining not only average FoS potential returns but also their variation around the mean. Considering a measure of dispersion in the occupational returns linked to the various degree programs in different cohorts was a way of tackling the possibly varying

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[3] An exception is Wilson (1978), where FoS were ranked by their (perceived) probability of graduates entering into high-level occupations.

uncertainty in labor market rewards. This might have been due to cyclical economic effects; for instance the economic crisis might have not only penalized the average returns of graduates from specific disciplines, but also increased their variability in occupational outcomes. A large dispersion would indicate higher uncertainty around the expected returns conveyed by the FoS attended and would therefore be a less desirable outcome.

5.2   Data and variables

We used data from the last five waves of the Italian Graduates Employment Survey (GES, hereafter) carried out by the Italian Statistical Institute (Istat). GES collected information in 1998, 2001, 2004, 2007 and 2011 about graduates who had received their degrees three years before. With regard to the waves from 1998 to 2007, only students who graduated in the pre-Bologna Process system were selected, while for the last wave (2011) we considered graduates who had obtained a bachelor's, a master's or a 'unique-cycle-level' degree in the post-reform system.[4] This means that the comparison between the fourth and the fifth cohort indicated how social inequalities changed after the introduction of the new degree structure.

We used two types of dependent variables. The first one measured FoS as a categorical variable composed of seven groups. The humanities field consists of arts and languages, whereas the social sciences include psychology, educational, social and political sciences. The third group comprises graduates in law and the fourth those who received a degree in economics and statistics. The technical field includes engineering, architecture and the agriculture degree programs,[5] while the science category consists of mathematics, physics, geology, and biology. Graduates in medicine were classified in a separate category. We excluded health-related subjects leading to professions such as nursing, physiotherapy and midwifery because they became part of the university system only after the implementation of the Bologna Process and their curricula are not comparable with the ones taught in the medical schools. However, we have conducted additional exploratory analysis also considering this category of graduates and we report the main findings in the results section.

The second type of dependent variables refers to indicators of the potential occupational value of FoS, which are labelled respectively as 'expected returns' and 'variation in returns'.[6] The former is the average predicted *probability of entering the upper classes*. This category includes occupations belonging to classes 1 and 2 in the ESEC classification (Rose and

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[4] Among the individuals interviewed in 2007 there were some students who earned their bachelor's degree in the post-reform system. We decided to exclude them because they are a very selected subsample/subpopulation. Indeed, some of them had enrolled at the university in 2001 and they were able to take a degree in 2004, while other students, who had earned a bachelor's degree in 2004, exploited the chance to shift from the old system to the new one. This means that the first group was mainly constituted of positively selected students, while the second one was composed of negatively selected students, namely less skillful individuals who were not able to earn a degree under the old system.

[5] Including the agriculture degree programs in the science field does not change the results of the analyses.

[6] Each indicator was calculated with and without the sampling weights; nevertheless, there were no major differences between weighted and unweighted measures. In any case, following guidelines on the use of data provided by the Istat, we used the weighted estimates.

Harrison 2010), for instance professionals, higher technicians, managers, administrators and higher supervisors. In this way, we considered prestigious occupations for which a remarkable investement in human capital is required. The second indicator is the coefficient of variation in the probability of entering the upper classes, which we interpret as a measure of the *uncertainty in the occupational returns*. The coefficient of variation is defined as the standard deviation divided by the mean. In contrast with the variance and the standard deviation, the coefficient of variation provides a dimensionless measure of the variability relative to its mean and is therefore more suited to compare different cohorts (Lovie 2005).

These outcome variables were computed at aggregated level relying on external data sources. More precisely, we estimated average values across combinations of groups of degree programs (10 categories), 5 cohorts (5 categories), gender and 3 macro-geographical areas in order to account for heterogeneity in terms of occupational rewards and to allow a degree of variability of the outcome variable. One challenge is that the field-specific wages may not be exogenous to the composition of the group that attends them. Do higher background students enter the well-paying fields more often if education expands, or do the fields become better-paid if high background individuals start to enter them? To tackle this measurement issue and try to avoid endogeneity of the response variables, we developed two adjustments. First, for each cohort we used lagged values, computing the average occupational returns from the *previous cohort* of GES graduates. Second, the estimates were computed by controlling for social origin using direct standardization. The direct method of adjusting for differences among populations involves computing the overall proportions that would result if, instead of having different distributions of the social background variable, all FoS across cohorts had the same standard distribution. The standardized proportions are defined as a weighted average of the stratum-specific proportions, with the weights taken from the standard distribution (Rothman 1986; StataCorp 2015). In this way we accounted for the fact that family background could directly affect the labor market outcomes beyond the effect of educational degree. If we had failed to take this into account, the occupational returns of FoS could have been biased. To our knowledge this is the first time that such adjustment has been done in this research stream.

The main independent variable was parental education[7], coded as follows: a) both parents with a university degree; b) at least one parent with a university degree; c) at least one parent with an upper secondary degree; and d) both parents with less than a lower secondary degree. We preferred to rely on the combination of the educational qualifications of both spouses in order to better capture the educational constellation of the family of origin and to differentiate more precisely at the top the distribution of the graduates' social origins (e.g. Triventi 2013).

The main control variables were sex, geographical area of residence (North, Centre, South and the Isles) and, in some analyses, high school track (lyceum, other humanistic schools,

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[7] We did not consider parental social class, because we did not have all the essential information to construct this variable in a detailed way for each wave. However, social class is very strongly associated with parental education in Italy. Unfortunately, family income was not present in the data, which is common in Italian surveys due to the often great reticence to answer this question.

technical/vocational schools) and final mark in upper secondary education (ranging from 60 to 100).

5.3 *Methods*

As described above (section 5.1), a three-step empirical strategy was followed. As the distribution of the dependent variables considered in the three steps differed, different statistical models were specified and estimated in each step.

In the first step, a set of multinomial logistic models were fitted in order to investigate whether social background influences the choice of the FoS and, if so, how this has changed over time. Considering that FoS is a discrete categorical variable assuming seven possible values, we modelled the odds, say η_{ij}, that student i falls in the field j (j =1, …, J-1) as opposed to a baseline field ($j = J$) as follows:[8]

$$(1) \qquad \eta_{ij} = \frac{\pi_{ij}}{\pi_{iJ}} = \alpha_j + \beta_j \cdot ParEdu_i + \delta_j \cdot Cohort_i + \lambda_j \cdot (ParEdu \times Cohort)_i + \gamma_j \cdot w_i$$

where α_j is a constant; β_j is the vector of coefficients (one per FoS category) of the main independent variable (parental education); δ_j are the regression coefficients of four dummy variables for the cohort; λ_j is an array of coefficients of the interaction of parental education and wave of interview; γ_j is a vector of coefficients associated with individual socio-demographic characteristics (gender and geographical area). Results of the multinomial regression model were retrieved by log-likelihood maximization and are presented in the next section in form of predicted probabilities and odds of graduating from each field as opposed to the social sciences[9].

In the second step, the relationship between social background and the expected occupational returns resulting from the FoS pursued was investigated through the use of fractional logistic regression models (Papke and Wooldridge 1996). Such an approach is appropriate when the dependent variable to be modeled is bounded in an interval. In our case, we were interested in how FoS influences the probability of entering the upper classes. As both variables are continuously measured proportions bounded in the [0,1] interval and with a finite number of boundary observations (i.e., 0s and 1s), the use of fractional logistic models based on a quasi-

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[8] This model specification was selected since it displayed a better fit with the data (log-likelihood, AIC, BIC) in comparison with more complex alternative specifications, in which track and marks also interact with cohort.

[9] The choice of social sciences as the baseline category for the FoS was carefully made in order to take into consideration the fact that the multinomial model (like other probabilistic choice models) relies on the validity of the Independence from Irrelevant Alternatives (IIA) assumption. Although tests to check the validity of the IIA have been proposed in the past, their limitations have been highlighted more than once in the literature (McFadden, Train, and Tye 1981). As suggested by McFadden (1974), we opted for a theoretical analysis of the Italian HE system since we believed that adding a new FoS or changing the characteristics of the fields already considered would not affect the relative odds computed with respect to the social sciences category.

likelihood estimation (McCullagh 1983) ensured consistent and normally distributed estimates of the parameters of interest (Kieschnick and McCullough 2003; Ramalho, Ramalho, and Murteira 2009). The log-likelihood function of the model is as follows:

(2) $l_i(\theta) = y_i \log[G(x_i\theta)] + (1 - y_i) \log_i[1 - G(x_i\theta)]$

where y_i is the fractional labor market outcome of interest; x_i is a set of covariates including FoS, our main independent variable of interest, social background and the other students' characteristics potentially affecting labor market outcomes described in the previous section; θ is the set of coefficients associated with the covariates; G is the logistic function. It is worth noting that, for consistent parameter estimates, the fractional logistic approach we followed does not assume any distribution of the dependent variable, but only requires the conditional mean to be correctly specified. Under the (weak) assumption that the logistic function is appropriate for modeling labor market returns, our estimates are unbiased.

In the third step, we employed OLS regressions to model the coefficient of variation (as a measure of the variability of returns around the mean) of the probability of entering upper social classes. In this case, as the dependent variables were not bounded in an interval (therefore potentially assuming values on the whole real line) standard OLS regressions provided unbiased estimates of the role of social backgrounds in graduating from FoS associated with different degrees of variability in later-life occupational rewards. However, as the variance of the distribution of the coefficient of variation might not have been independent of its mean, robust standard errors were retrieved to avoid potential heteroscedasticity problems.

In the second and third steps of our empirical strategy, in order to test our hypotheses, we estimated two main model specifications fitted on data from all the five waves pooled together. The first one (Model 1) included parental education, cohort of interview, their interaction, socio-demographic characteristics and dummy variables for the length of degree program (long 4-5 year program, 3-year bachelor, 2-year master) as covariates. The second model (Model 2) specification also controlled for prior schooling variables including upper secondary school type and final mark.

Whilst the first model was mainly used to examine trends in total horizontal social inequality in field of graduation, the second one was employed to check whether school choices referred to secondary education levels and a proxy for ability accounted for different outcomes by parental education.

6 Empirical results

6.1 Descriptives

In this section, some descriptive evidence on the main variables used in the analyses and the bivariate relationship between social origin and profitability of the FoS are presented.

Table 1 reports the percentage of graduates by FoS in each of the five cohorts under scrutiny and shows a degree of heterogeneity in trends over time. While science degrees remained overall fairly stable around 10-12%, other fields have experienced more pronounced changes. The most remarkable expansion occurred in the social sciences, which share of students increased from 9% to 27%. A growth in the proportion of graduates occurred also in the technical field, from 12% to 19%. Conversely, other FoS have seen a reduction in the share of graduates: this is the case for the humanities (from 18 to 14%) and medicine (from 7 to 4%), and most prominently for law (from 20 to 11%) and economics/statistics (from 22 to 14%).

[Table 1, about here]

Figure 2 displays the average expected returns and uncertainty in the returns across time by FoS. Looking at the expected probability of accessing the service class over time, we can see that FoS are clustered in three main groups. Graduates in medicine shows an outstanding performance, with an average 65% of the graduates in this field entering the upper class. Medicine is followed by law and technical degrees, for which the probability of accessing the service class is 0.43 and 0.36 respectively. In the last group this probability does not exceed 0.20, with economics/statistics displaying relatively better performance (0.16) than scientific disciplines (0.13), humanities (0.12) and social sciences (0.11). Between the 1995 and 2007 cohort, the expected returns of graduates from economics/statistics and social sciences have declined to some extent, while there has been a tremendous growth among medicine graduates, from .48 to 0.68. The other FoS shows some fluctuations over time, but no any clear trend emerges.

[Figure 2, about here]

Interestingly, the inspection of the coefficient of variation of the probability of entering the upper class by FoS (Figure 2, graph on the right) reveals that the degrees with higher expected returns were also those with the lowest uncertainty. In 1995 the uncertainty in the returns was rather low in medicine, law and technical degrees. However, in the following cohorts a divergence among these FoS occurred: while in medicine the variation in returns reduced further, in law and the technical fields it slightly increased. Disciplines with lower average returns showed a different situation. Among the 1995 cohort of graduates there was a clear ranking, with economics/statistics having a lower uncertainty in the chance of entering the service class, followed by natural and social sciences, and finally humanities. However, the differences between these FoS declined in the following cohorts and ended up converging towards a similar level (around 0.35) in 2007.

6.2 Analyses of FoS as a categorical outcome

We began our analysis estimating a multinomial logistic regression with an interaction between parental education and cohort, in order to check whether the role of social background in graduating from various FoS changed between 1995 and 2007. Figure 3 reports the predicted probabilities obtained from this model, presented according graduates' cohort and parental education. The graph clearly shows heterogeneity in the pattern of association between parental education and graduation from various FoS. The most notable changes interested social sciences and medicine. For both of them in the 1995 cohort the differences in graduation by parental education were pretty small, but social background increasingly became important in the following cohorts, leading to an overall increase in social inequalities. On one hand, the probability of graduating from the social sciences grew in all the social categories, but to a much larger extent among those with lowly educated parents and this occurred particularly in the transition to the 'new degrees systems'. On the other hand, while the propensity to graduate in medicine of those with both university educated parents remained almost constant during the whole period, it sharply declined among those with lower and upper secondary educated parents. Two aspects of this trend should be noted. First, it is a longer-term trend that started already in the 1998 cohort, before the Bologna-process. Second, since we know that the dropout rate in medicine programs is rather low – mainly due to the highly selective admissions test – we can draw the conclusion that this increasing inequality is produced at entry and not during the course of higher education study. Unfortunately we cannot establish if this is due to a lower propensity to apply for medical programs or to decreased chances of passing the selective entry test by these students.

[Figure 3, about here]

A second group of fields – namely economics-statistics and law – is instead characterized by stable or declining inequalities. In particular, in the 1995 cohort graduates with university educated parents were much more likely to graduate from law compared to those with lower secondary educated parents (.27 verso .16), but this gap began to reduce from the 2004 cohort onwards, arriving at 6 percentage points in the most recent cohort (.15 versus .09). In economics the differences between social categories have been smaller and to the advantage of those coming from medium-low educated families. However, the declining trend in graduation from this field was stronger among these individuals rather than among those with university educated parents.

The differences by social background in the probability of graduating from scientific disciplines are basically null and are also very small when considering the humanities and the technical fields. While in the humanities and science no clear trend over time is visible, a small increase of the social background differentials in the last cohort of graduates can be seen in the technical fields, where students from lowly educated parents are less likely to be present.

Since the predicted probabilities and related absolute differences may be affected by the overall expansion and reduction of the various FoS, we present the results from the multinomial logistic regression also using odds-ratios, a measure which is less affected by changes in the marginal distribution of the outcome variable (Mare 1981). Instead of presenting raw estimates from the model, we computed appropriate odds ratios pertaining to the interaction effect, following the procedure suggested by Buis (2010). Selected results from this computation are reported in figure 4, which shows the odds of attaining a degree in each FoS rather than doing so in the social sciences, comparing graduates with parents who had graduated from tertiary education and those who did not attain more than lower secondary education.

[Figure 4, about here]

Overall, the results derived from the odds ratios are consistent with what presented so far, but provide some additional insights. Individuals with both tertiary educated parents are more likely to graduate from each FoS rather than social sciences compared to those with lowly educated families. The largest relative differences between these groups are found in graduation from law, which did not change much in the period under scrutiny. In the earlier cohort those with lowly and highly educated families had a similar odds of graduating in medicine rather than in the social sciences, potentially due to the fact that the former were particularly positively selected. However, in the more recent cohorts, a new advantage in favor of students from the most advantaged backgrounds has appeared. In the cohorts who attended university under the 'old system', the odds-ratios pertaining to the comparison of social sciences with the humanities, technical and scientific disciplines indicate relatively small differences between groups; nonetheless, in all these three FoS inequalities in graduation enlarged suddenly in the cohort attending the post-reform system. At the end, the odds of graduating from economics/statistics rather than in the social sciences do not statistically differ by parental education in most of the cohorts or are substantially small.

6.3   Graduation from remunerative FoS and variations in the expected returns

In this section we assess whether the occupational advantages related to FoS accessed by graduates with different background were stable or changed over time. Firstly, we examined the expected returns in terms of access to the upper class. Secondly, we also scrutinized whether the dispersion of such potential occupational rewards had changed over cohorts differently according to graduates' social backgrounds.

Figure 5 reports the gap in the expected probability of entering the upper class between graduates with different social backgrounds and those with two university educated parents, derived from the fractional logit models. The black dots refer to the basic model specification, while grey dots/lines to the models including previous school track and school marks.

Looking at estimates from the first model specification, we observe statistically significant differences among the groups. The pattern of advantage reflects a clear gradient with

individuals with both university educated parents (the omitted reference category) graduating from fields with the highest expected returns, followed by those with only one parent with tertiary education and, finally by those whose parents attained no more than upper and lower secondary education.

The association between parental education and the expected occupational returns related to the field attended increased over time. In other words, graduates with more advantaged backgrounds were increasingly able to obtain a degree from those disciplines characterized by better occupational returns, in terms of access to the upper class.

[Figure 5, about here]

While in the 1995 cohort those with lowly educated parents had a penalty of around 2 percentage points, this almost tripled in twelve years, arriving at slightly less than 6 percentage points. Interestingly, the time trends do not show a visible discontinuity between the 2004 and the 2007 cohorts, those marking the transition to the 'bachelor+master' structure. On the contrary, a progressive enlargement of horizontal inequality occurred in the whole period covered by our study.

Looking at the second series of estimates reported with hollow circles (Model 2), we see that accounting for the final mark in high school and the type of diploma contributes to reducing the magnitude of the partial effects associated to parental education. However, they are still significantly larger than zero and display a similar pattern over cohorts.

Finally, we investigated whether individuals with different social backgrounds graduated from programs that are characterized by different amounts of variability in their subsequent occupational rewards. The higher the dispersion of the labor market returns, the greater is the uncertainty surrounding the value of graduating from a given FoS and, therefore, the less desirable is the outcome.

[Figure 6, about here]

In the estimated regression models the coefficient of variation of the dependent variable was the predicted proportion of graduates in each field entering the upper class. Results reported in Figure 6 consistently suggest that not only parental education positively affects access to the most prestigious occupations, but also that graduates from higher origin are more likely to graduate from fields with less uncertain occupational rewards. Furthermore, this advantage was quite small in the 1995 cohort, largely increased in 1998, remained stable in the following cohorts and then suddenly expanded again between 2004 and 2007. Thus, the disadvantage of graduates with less-well-educated parents compared to those with both tertiary educated parents increased markedly between 1995 and 2007. Moreover, differently from what we observed before, a discontinuity is detected after the introduction of the new course structure in the context of the Bologna Process. Controlling for upper secondary school track and marks (Model 2) accounts for a non-negligible part of the social origin differentials, but without changing the qualitative pattern of findings.

7   Conclusions

In recent years a reduction in the effect of social background on tertiary education attainment has occurred in several European countries. The improvement of educational opportunities for disadvantaged children is often interpreted as a democratization of the educational systems. However, social stratification research suggests that this trend could have been negatively counterbalanced by the growth of horizontal inequalities (Charles and Bradley 2002; Ayalon and Yogev 2005).

We addressed this issue by analyzing horizontal inequalities in Italian higher education, with a focus on the role of parental education in relation to graduation from better rewarding FoS. As argued in the introductory section, Italy is an interesting case because of several concomitant phenomena that have occurred in the last fifteen years, including an increasing complexity in the choice of degree programs, expanding graduation rates and growing difficulties in the education-to-work transition among the youths, which may have led to a stronger competition among graduates in the labor market.

We found that in Italy parental education is associated with FoS of graduation, thus corroborating our first hypothesis. In particular, individuals with highly educated parents were more likely to obtain a degree in law and medicine, while they were much less likely to graduate from programs in the humanities and the social sciences. This pattern resembles that found in other European countries (e.g. Reimer and Pollak 2010).

In line with our second hypothesis, we found that the strength of the association is in some respects moderate. However, some of the results – especially those regarding the comparison of law and medicine graduates compared to social scientists – suggest rather large differences across groups (e.g. odds-ratios ranging from two to three), despite the selectivity of the population under scrutiny.

Contrary to what identified in previous studies on the US (Hearn 1984; 1991) and the UK (Bratti 2006), but similarly to what reported by Goyette and Mullen (2006), we found that most of the differences across social origins regarding the FoS of graduation are not accounted by previous school track and marks in high school. In other words, while having followed an academic track and achieved high marks strongly increased the chances of graduating from most rewarding subjects, these factors were far from being the only drivers of social inequalities in FoS of graduation.

This result is consistent with those of previous works suggesting that in Italy the reproduction of social inequalities at lower school levels is largely driven by 'secondary effects' (decisions related to educational transitions, once previous performance is accounted for) rather than 'primary effects' (school marks or performance) (Contini and Scagni 2013). The relative importance of students' decisions, regardless of their previous school achievement, could be magnified by the fact that only a minority of degree programs at undergraduate level require students to pass a selective entrance test. An additional potential source of inequality in terms of graduating from specific FoS could be related to heterogeneous pathways across social groups subsequent to university enrollment. Among students from low background who

entered a potentially rewarding field, the need to work while studying at university, due to the scarcity of public support and the underdevelopment of student loans, might have made their academic progression and integration difficult, thus increasing their risk of drop-out or decision to shift to a less demanding program.

In agreement with the fourth hypothesis, we found an increase over time in the association between social background and graduation from remunerative FoS. In particular, this was driven by the increased gap in the probability of graduating in medicine and the social sciences. Among the new cohorts, more graduates from lowly educated families opted for the less demanding but also poorly rewarding programs in the social and educational sciences. This was paralleled by a decreasing propensity to graduate in the more demanding but highly rewarding programs in medicine.

According to our fifth hypothesis, we would have expected a sudden increase in social inequality after the introduction of the new degree programs. The results on this aspect are mixed. On the one hand, looking at the expected probability of entering the upper class the increase in inequality has developed during the whole period under scrutiny. On the other hand, when looking at the uncertainty in the expected pay-offs of the discipline attended in university a discontinuity between the 'old' system of qualifications and the new system established by the 'Bologna Process' was detected.

Our findings speak to two streams of social stratification research. The first is research on the 'effectively maintained inequality' (Lucas 2001) and the 'diversion' theses (Brint and Karabel 1987). In line with the predictions from these arguments, we found that students from higher social backgrounds are more likely to graduate from the most advantageous educational programs in higher education. Moreover, horizontal inequalities in graduation from various FoS have increased in a period of expansion of higher education. The second is the literature on the nominal versus positional value of educational credentials (Park and Shavit 2016). Looking at the overall educational attainment, it has been shown that differences by social background tend to decline over time when analyzing the attainment of educational titles in nominal terms, but they are stable or even increase in some countries when the relative/changing value of the different educational qualifications is considered. Italy was found to be an exception to this pattern (Triventi et al. 2016), with social inequalities in education declining using both approaches. However, that study was unable to consider horizontal stratification of education into account. Extending this research, we found that the qualitative differentiation in higher education contributes remarkably and increasingly to reproducing social inequalities in occupational rewards in Italy.

In summary, our study contributes to the literature on social stratification in education providing empirical evidence that supports the conclusion that the expansion of the higher education system in Italy has not been mirrored by a reduction of the influence of social background on education opportunities. Although students from disadvantaged backgrounds have more chances now than ever before to progress to tertiary education, what they end up studying at university does provide them with less advantageous outcomes in the labor market as those of their advantaged peers. Therefore the reproduction of inequality seems to have, at least partly, shifted from a vertical to a horizontal dimension. From a policy-making

perspective, although a huge effort directed at widening participation has been expended by governments worldwide, our findings suggest that there is still work to do in order to ensure equality of opportunity for students from different social backgrounds.

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Tables

Table 1 - Percentage of students/graduates by field of study

	1995	1998	2001	2004	2007	Total
Field of study						
Social sciences	8.6	13.5	16.9	21.1	27.3	19.0
Humanities	17.7	16.1	14.9	15.4	13.8	15.3
Law	20.0	15.2	16.2	15.8	10.8	15.0
Economics/Statistics	21.9	19.4	17.9	16.2	14.3	17.3
Technical	12.5	19.3	19.2	17.9	19.2	18.2
Science	11.8	11.6	10.2	9.3	10.2	10.4
Medicine	7.3	5.1	4.6	4.3	4.4	4.9
Total	100.0	100.0	100.0	100.0	100.0	100.0
N	12,088	19,945	24,287	24,307	37,824	118,451

Note: weighted estimates on the final analytical sample

Figures
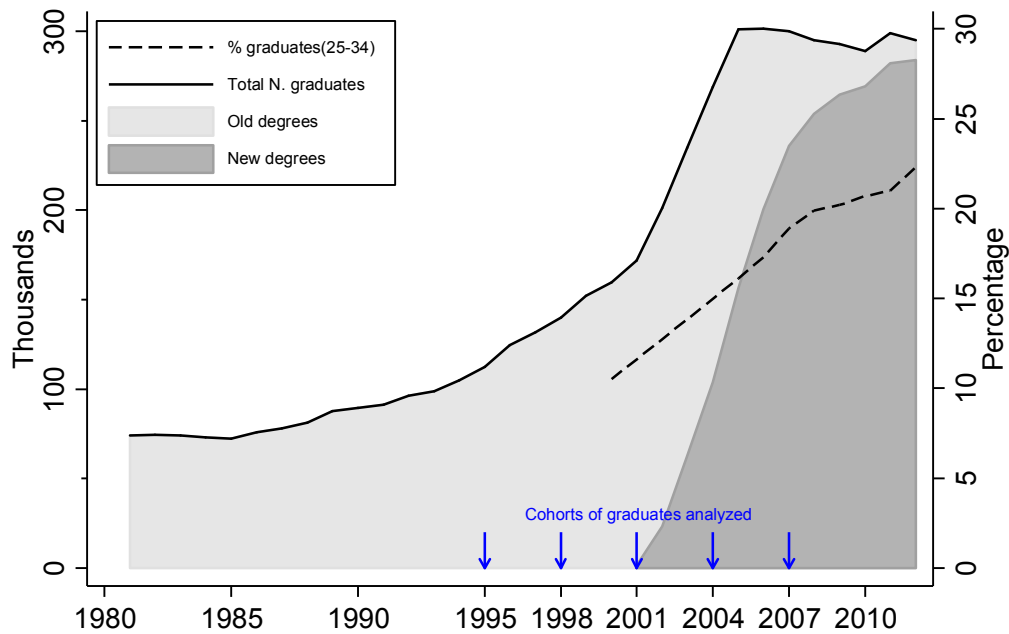
Fig. 1 – Indicators of expansion of tertiary education degrees in Italy, 1981-2012
Note: the absolute number of graduates provides a rough count of the total number of degrees awarded in each year. It may count twice the same graduate if s/he received a bachelor and a master degree in the time span covered by the data.
Sources: Anvur 2013 (number of degrees), Oecd online database (% of graduates)
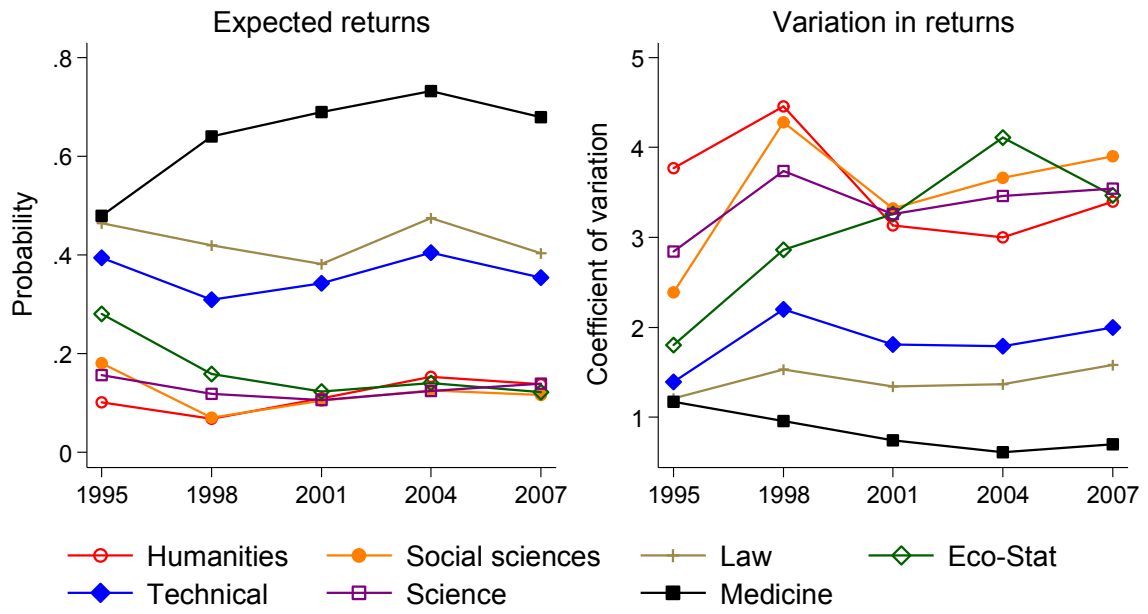
Fig. 2 – Average values (left) and coefficient of variation (right) of the expected probability of entering the upper class by field of study and over time
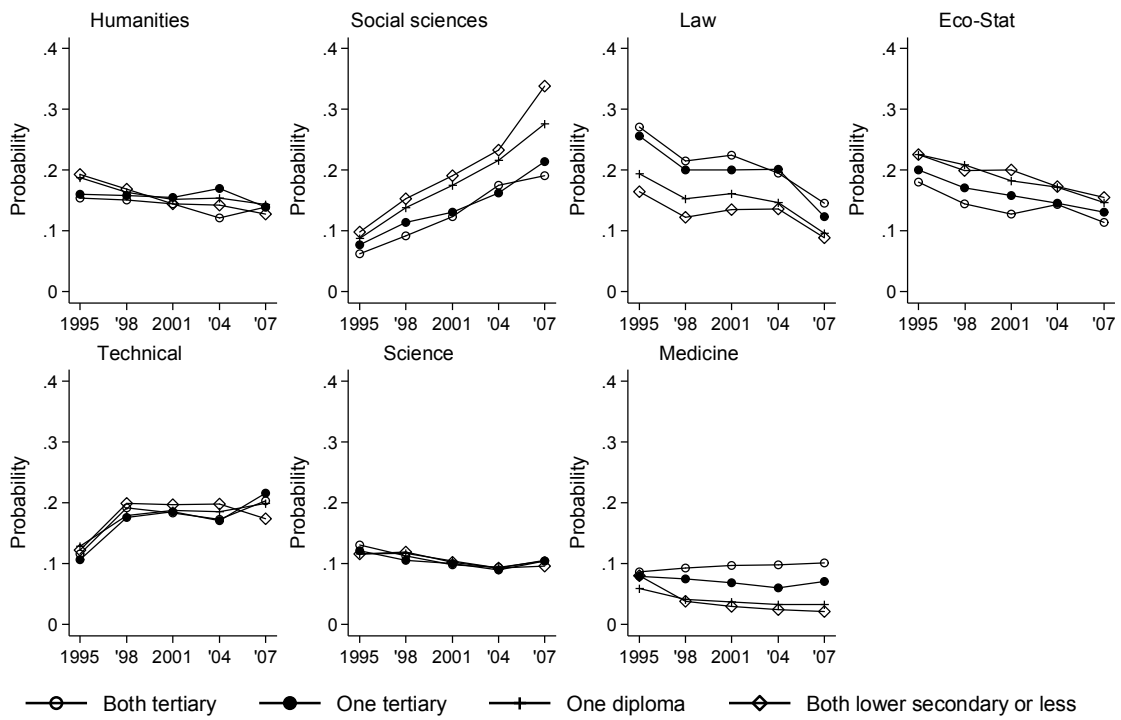
Fig. 3 – Multinomial logistic regression model: predictive margins of graduating in different fields of study according to year of graduation and parental education
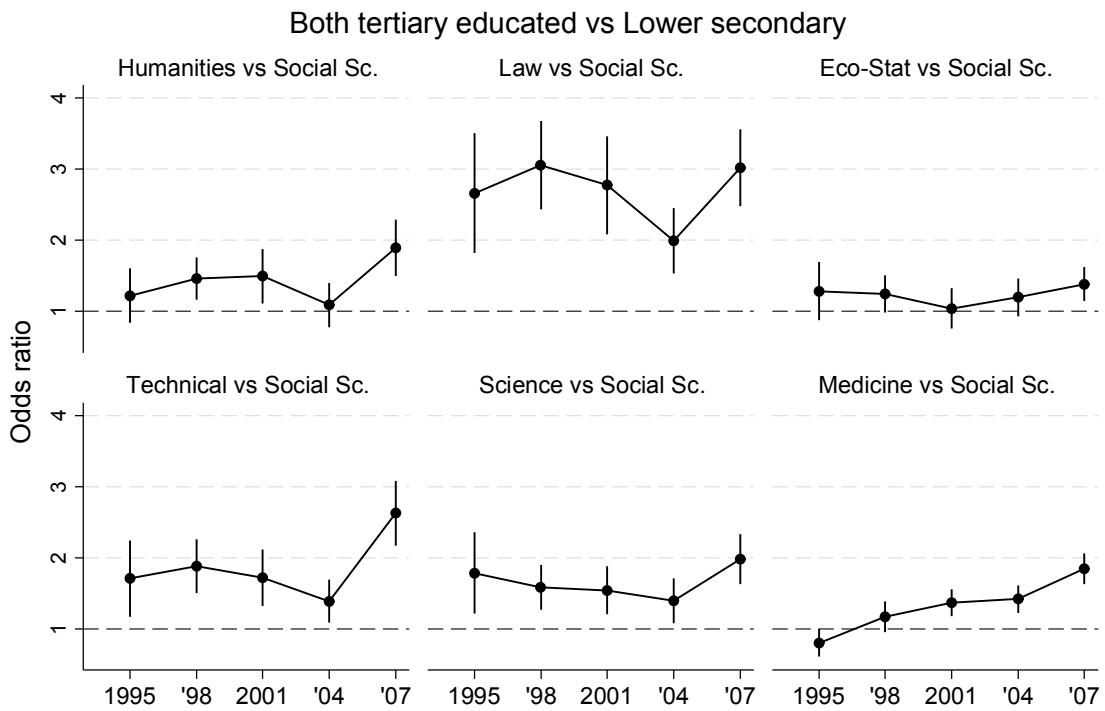
Fig. 4 – Multinomial logistic regression models: predicted odds ratios of entering each field of study versus social sciences comparing individuals with both tertiary educated parents and those with lowly educated parents

3
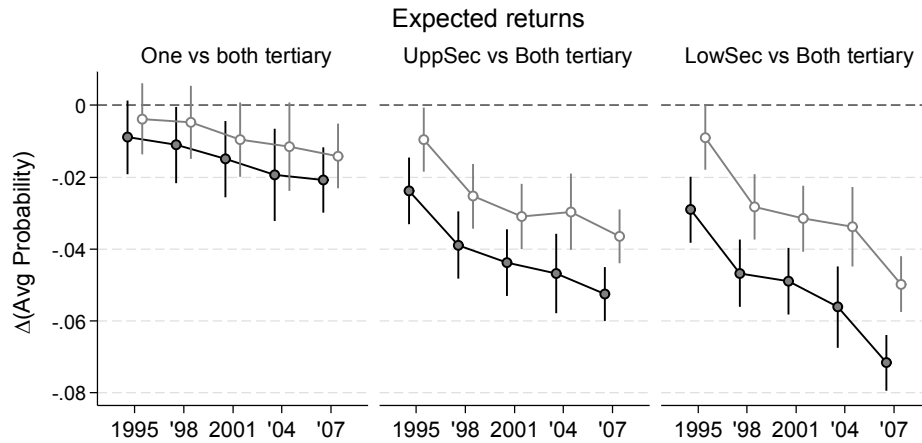
Expected returns

Fig. 5 – Fractional logit models: average partial effects (and 95% confidence intervals) of parental education on the expected returns of field of study attended, in terms of average probability of entering the service class.
Note: filled dots indicate estimates from Model 1, while hollow circles represent estimates from Model 2 that controls for high school track and marks.
Including all graduates (both bachelor and master graduates in 2007), controlling for type of tertiary degree

Variation in returns
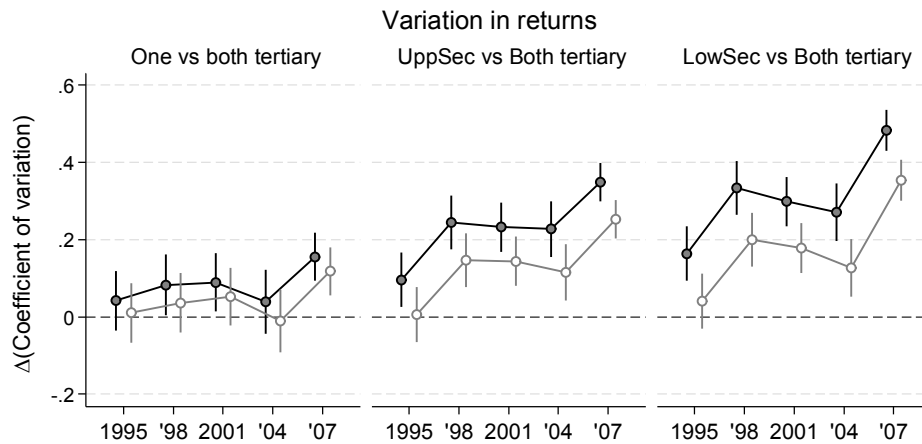
Fig. 6 – OLS regression models: average partial effects (and 95% confidence intervals) of parental education on the uncertainty in the potential payoffs of field of study attended (coefficient of variation of the probability of entering the service class.
Note: filled dots indicate estimates from Model 1, while hollow circles represent estimates from Model 2 that additionally controls for high school track and marks.
Including all graduates (both bachelor and master graduates in 2007), controlling for type of tertiary degree

Supplementary material – Online

Estimates reported in Figures 3-6

Table A1 - Estimates reported in Figure 3 (Multinomial logit models: predictive margins of graduating in different fields of study according to year of graduation and parental education)

|	Humanities		Social Sciences		Law		Eco-Stat		Technical		Science		Medicine	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
Parental education-year of graduation														
Both tertiary-1995	0.154	0.011	0.062	0.008	0.271	0.015	0.180	0.012	0.116	0.009	0.130	0.009	0.086	0.009
Both tertiary-1998	0.151	0.008	0.092	0.006	0.215	0.010	0.145	0.009	0.192	0.009	0.112	0.006	0.093	0.006
Both tertiary-2001	0.145	0.011	0.123	0.009	0.225	0.014	0.127	0.011	0.184	0.009	0.099	0.006	0.098	0.004
Both tertiary-2004	0.121	0.010	0.175	0.012	0.195	0.011	0.144	0.009	0.173	0.009	0.094	0.006	0.098	0.004
Both tertiary-2007	0.139	0.009	0.191	0.009	0.146	0.007	0.115	0.006	0.203	0.007	0.105	0.005	0.102	0.003
One tertiary-1995	0.160	0.008	0.077	0.007	0.255	0.011	0.200	0.010	0.107	0.006	0.121	0.007	0.080	0.007
One tertiary-1998	0.158	0.007	0.114	0.006	0.200	0.008	0.171	0.008	0.176	0.007	0.106	0.005	0.075	0.005
One tertiary-2001	0.155	0.009	0.131	0.008	0.200	0.010	0.159	0.011	0.186	0.007	0.101	0.005	0.069	0.003
One tertiary-2004	0.170	0.016	0.162	0.009	0.201	0.010	0.146	0.007	0.171	0.007	0.090	0.005	0.060	0.003
One tertiary-2007	0.139	0.009	0.214	0.009	0.124	0.006	0.131	0.006	0.216	0.007	0.105	0.005	0.071	0.002
One diploma-1995	0.188	0.006	0.088	0.005	0.194	0.007	0.226	0.007	0.129	0.005	0.116	0.005	0.059	0.004
One diploma-1998	0.163	0.005	0.138	0.004	0.153	0.005	0.208	0.005	0.179	0.004	0.117	0.004	0.041	0.002
One diploma-2001	0.152	0.006	0.175	0.006	0.161	0.006	0.183	0.007	0.187	0.005	0.105	0.003	0.037	0.001
One diploma-2004	0.154	0.008	0.216	0.007	0.147	0.006	0.172	0.005	0.185	0.005	0.093	0.003	0.033	0.001
One diploma-2007	0.144	0.004	0.276	0.005	0.096	0.003	0.147	0.003	0.200	0.004	0.105	0.003	0.033	0.001
Both lower secondary or less-1995	0.193	0.006	0.098	0.005	0.164	0.006	0.226	0.007	0.123	0.005	0.116	0.004	0.080	0.005
Both lower secondary or less-1998	0.169	0.005	0.153	0.004	0.123	0.004	0.199	0.005	0.199	0.005	0.119	0.003	0.038	0.002
Both lower secondary or less-2001	0.145	0.006	0.191	0.006	0.135	0.006	0.201	0.007	0.197	0.005	0.102	0.003	0.030	0.001
Both lower secondary or less-2004	0.143	0.007	0.233	0.008	0.136	0.006	0.172	0.006	0.198	0.006	0.093	0.004	0.025	0.001
Both lower secondary or less-2007	0.128	0.005	0.338	0.007	0.088	0.003	0.155	0.004	0.174	0.004	0.096	0.003	0.022	0.001

Note: *** p<0.01, ** p<0.05, * p<0.1

Table A2 - Estimates reported in Figure 4 (logit models: Odds ratios and standard errors of entering each field of study versus Social Sciences comparing individuals with both tertiary educated parents and those with lowly educated parents)

Field of study	Year	Both tertiary vs At least one tertiary		Both tertiary vs At least one upper secondary		Both tertiary vs At least one lower secondary	
		Odds ratio	S.E.	Odds ratio	S.E.	Odds ratio	S.E.
Humanities vs Social Science	1995	1.070	0.098	1.031	0.125	1.220	0.197
	1998	1.065	0.066	1.245	0.104	1.459	0.153
	2001	1.136	0.093	1.546	0.169	1.491	0.196
	2004	1.154	0.114	1.658	0.246	1.088	0.159
	2007	1.369	0.095	1.673	0.172	1.892	0.203
Law vs Social Science	1995	1.269	0.130	1.977	0.251	2.659	0.431
	1998	1.351	0.096	2.290	0.200	3.055	0.318
	2001	1.286	0.108	2.242	0.236	2.772	0.352
	2004	1.132	0.094	2.180	0.226	1.988	0.235
	2007	1.287	0.084	2.208	0.188	3.017	0.276
Eco-Stat vs Social Science	1995	1.114	0.108	1.154	0.146	1.279	0.209
	1998	1.164	0.073	1.186	0.102	1.242	0.133
	2001	1.007	0.081	1.194	0.141	1.038	0.144
	2004	1.077	0.077	1.271	0.121	1.195	0.134
	2007	1.178	0.065	1.413	0.112	1.380	0.123
Technical vs Social Science	1995	1.246	0.123	1.216	0.162	1.707	0.273
	1998	1.035	0.065	1.312	0.113	1.880	0.195
	2001	1.087	0.075	1.547	0.143	1.717	0.202
	2004	1.026	0.075	1.384	0.140	1.389	0.153
	2007	1.564	0.093	2.495	0.210	2.625	0.231
Science vs Social Science	1995	1.107	0.111	1.332	0.173	1.783	0.291
	1998	1.087	0.068	1.204	0.102	1.580	0.160
	2001	1.125	0.078	1.456	0.136	1.542	0.174
	2004	1.069	0.081	1.413	0.143	1.393	0.159
	2007	1.345	0.082	1.761	0.145	1.979	0.179
Medicine vs Social Science	1995	0.801	0.099	0.801	0.099	0.801	0.099
	1998	1.171	0.111	1.171	0.111	1.171	0.111
	2001	1.365	0.096	1.365	0.096	1.365	0.096
	2004	1.418	0.098	1.418	0.098	1.418	0.098
	2007	1.845	0.111	1.845	0.111	1.845	0.111

Table A3 - Estimates reported in Figures 5 and 6 (Fractional logit and OLS models: average partial effects (and standard errors) of parental education on the potential payoffs and on their dispersion of field of study attended, in terms of probability of entering the service class

		Upper class					Upper class (CV)			
		Model 1		Model 2			Model 1		Model 2	
	Year	Coeff.	S.E.	Coeff.	S.E.		Coeff.	S.E.	Coeff.	S.E.
One vs Both tertiary	1995	-0.009*	0.005	-0.004	0.005		0.042	0.039	0.010	0.040
	1998	-0.011**	0.005	-0.005	0.005		0.083**	0.040	0.037	0.040
	2001	-0.015**	0.005	-0.010*	0.005		0.089**	0.038	0.052	0.038
	2004	-0.019***	0.007	-0.012*	0.006		0.040	0.042	-0.011	0.041
	2007	-0.021***	0.005	-0.014***	0.005		0.156***	0.032	0.118***	0.032
Upper Secondary vs Both tertiary	1995	-0.024***	0.005	-0.010**	0.005		0.096**	0.036	0.006	0.036
	1998	-0.039***	0.005	-0.025***	0.005		0.244***	0.036	0.146***	0.035
	2001	-0.044***	0.005	-0.031***	0.005		0.233***	0.032	0.144***	0.033
	2004	-0.047***	0.006	-0.030***	0.005		0.227***	0.037	0.115***	0.037
	2007	-0.052***	0.004	-0.037***	0.004		0.349***	0.025	0.252***	0.025
Lower Secondary vs Both tertiary	1995	-0.029***	0.005	-0.009**	0.005		0.164***	0.036	0.040	0.036
	1998	-0.047***	0.005	-0.028***	0.005		0.334***	0.035	0.200***	0.035
	2001	-0.049***	0.005	-0.032***	0.005		0.299***	0.033	0.178***	0.033
	2004	-0.056***	0.006	-0.034***	0.006		0.270***	0.038	0.127***	0.038
	2007	-0.072***	0.004	-0.050***	0.004		0.482***	0.027	0.353***	0.027

Note: *** p<0.01, ** p<0.05, * p<0.1

Complete regression models

Complete models for Figures 3-6

Table A4 – Complete model for estimates reported in Figure 3 (logit parameters and robust standard error)

	Social Sciences vs Humanities		Law vs Humanities		Eco-Stata vs Humanities		Technical vs Humanities		Science vs Humanities		Medicine vs Humanities	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
Parental education (Ref.: Both tertiary)												
One tertiary	0.171	0.186	-0.106	0.130	0.057	0.135	-0.139	0.143	-0.122	0.136	-0.125	0.173
One diploma	0.148	0.167	-0.544***	0.119	0.025	0.121	-0.100	0.126	-0.318**	0.121	-0.577***	0.160
Both lower secondary or less	0.231	0.164	-0.742***	0.118	-0.007	0.119	-0.183	0.125	-0.347***	0.119	-0.311**	0.154
Year of graduation (Ref.: 1995)												
1998	0.427**	0.179	-0.196	0.134	-0.169	0.143	0.573***	0.142	-0.108	0.137	0.115	0.168
2001	0.756***	0.193	-0.116	0.154	-0.265	0.169	0.553***	0.153	-0.204	0.150	0.199	0.167
2004	1.279***	0.197	-0.088	0.157	0.028	0.160	0.662***	0.160	-0.075	0.157	0.377**	0.172
2007	1.232***	0.177	-0.522***	0.136	-0.335**	0.142	0.690***	0.141	-0.110	0.139	0.273*	0.158
*Parental education*year*												
One tertiary*1998	-0.013	0.221	-0.022	0.170	0.053	0.178	-0.016	0.180	0.007	0.175	-0.140	0.214
One tertiary*2001	-0.185	0.239	-0.082	0.195	0.092	0.214	0.080	0.195	0.073	0.191	-0.295	0.212
One tertiary*2004	-0.588**	0.261	-0.211	0.217	-0.397*	0.218	-0.233	0.220	-0.272	0.219	-0.709***	0.235
One tertiary*2007	-0.056	0.225	-0.058	0.181	0.081	0.185	0.205	0.186	0.127	0.184	-0.231	0.205
One diploma*1998	0.176	0.198	0.115	0.154	0.254	0.159	-0.060	0.159	0.278*	0.155	-0.325*	0.199
One diploma*2001	0.149	0.213	0.150	0.177	0.283	0.187	0.068	0.172	0.325*	0.170	-0.442**	0.194
One diploma*2004	-0.177	0.220	0.007	0.182	-0.095	0.181	-0.083	0.183	0.054	0.181	-0.754***	0.202
One diploma*2007	0.182	0.195	0.082	0.156	0.178	0.158	0.030	0.158	0.281*	0.157	-0.588***	0.183
Both lower secondary or less*1998	0.164	0.195	0.058	0.154	0.213	0.158	0.101	0.157	0.290*	0.154	-0.695***	0.194
Both lower secondary or less*2001	0.212	0.211	0.224	0.178	0.471**	0.187	0.269	0.172	0.386**	0.169	-0.881***	0.190
Both lower secondary or less*2004	-0.104	0.219	0.216	0.183	0.028	0.181	0.159	0.183	0.169	0.181	-1.225***	0.198
Both lower secondary or less*2007	0.417**	0.196	0.302	0.159*	0.364	0.160	0.064	0.161	0.324**	0.161	-1.175***	0.182
Sex (Ref.: Female)												
Male	0.715***	0.034	1.203***	0.035	1.660***	0.033	2.551***	0.032	1.197***	0.032	1.238***	0.034
Geographic area of residence (Ref.: (North)												
Center	0.052	0.047	0.175***	0.048	-0.155***	0.046	-0.360***	0.044	-0.166***	0.045	0.002	0.047
South and Islands	-0.143***	0.036	0.516***	0.038	-0.115***	0.036	-0.321***	0.035	-0.051	0.035	0.204***	0.037
Constant	-1.046***	0.153	-0.006	0.106	-0.334***	0.111	-1.238***	0.115	-0.455***	0.109	-1.009***	0.140

Pseudo-R^2 = 0.0541

N = 118,451

Note: *** p<0.01, ** p<0.05, * p<0.1

Table A5 – Complete models for estimates reported in figure 4 (logit parameters and robust standard errors).

	Humanities vs Social sciences		Law vs Social sciences		Eco-Stat vs Social sciences		Technical vs Social sciences		Science vs Social sciences		Medicine vs Social sciences	
	Odds Ratio	S.E.	Odds Ratio	S.E.	Odds Ratio	S.E.	Odds Ratio	S.E.	Odds Ratio	S.E.	Odds Ratio	S.E.
Parental education *(Ref.: Both lower secondary or less)*												
At least one upper secondary	1.066	0.098	1.306***	0.134	1.099	0.106	1.255**	0.124	1.144	0.115	0.816*	0.100
At least one tertiary	1.036	0.125	1.976***	0.251	1.107	0.140	1.232	0.164	1.373**	0.179	1.295*	0.194
Both parents tertiary	1.208	0.195	2.516***	0.407	1.265	0.207	1.760***	0.282	1.875***	0.306	1.820***	0.346
Year of graduation *(Ref.: 1995)*												
1998	0.569***	0.043	0.481***	0.041	0.594***	0.047	1.362***	0.107	0.666***	0.053	0.316***	0.033
2001	0.391***	0.033	0.430***	0.040	0.485***	0.042	1.100	0.090	0.457***	0.038	0.201***	0.019
2004	0.320***	0.030	0.351***	0.033	0.335***	0.028	0.924	0.080	0.343***	0.030	0.137***	0.013
2007	0.203***	0.017	0.149***	0.013	0.196***	0.015	0.533***	0.044	0.235***	0.020	0.078***	0.007
Parental education*Year												
At least one upper secondary *1998	0.997	0.111	1.066	0.133	1.015	0.117	0.857	0.100	0.955	0.113	1.473**	0.229
At least one upper secondary *2001	1.081	0.133	0.985	0.130	0.851	0.107	0.861	0.104	0.988	0.121	1.682***	0.239
At least one upper secondary *2004	1.096	0.147	0.868	0.114	0.951	0.114	0.820	0.101	0.937	0.118	1.764***	0.249
At least one upper secondary *2007	1.289**	0.148	1.031	0.125	1.094	0.122	1.216	0.140	1.190	0.140	2.363***	0.324
At least one tertiary *1998	1.224	0.180	1.081	0.167	1.002	0.153	1.115	0.177	0.885	0.137	2.063***	0.379
At least one tertiary *2001	1.514**	0.247	1.097	0.181	1.023	0.177	1.283	0.208	1.082	0.173	2.649***	0.459
At least one tertiary *2004	1.632**	0.312	1.045	0.171	1.006	0.160	1.039	0.174	1.009	0.166	2.678***	0.464
At least one tertiary *2007	1.668***	0.265	1.141	0.175	1.203	0.180	1.847***	0.290	1.261	0.194	4.121***	0.688
Both parents tertiary *1998	1.232	0.237	1.170	0.225	0.919	0.180	1.088	0.207	0.858	0.165	2.268***	0.511
Both parents tertiary *2001	1.286	0.268	1.008	0.207	0.715	0.153	0.926	0.184	0.801	0.159	2.743***	0.593
Both parents tertiary *2004	0.943	0.205	0.751	0.150	0.880	0.175	0.760	0.148	0.735	0.147	2.965***	0.636
Both parents tertiary *2007	1.609**	0.311	1.174	0.218	1.018	0.190	1.363*	0.249	1.035	0.193	4.680***	0.962
Sex *(Ref.: Female)*												
Male	0.521***	0.018	1.611***	0.051	2.570***	0.074	6.354***	0.176	1.660***	0.047	1.629***	0.050
Geographic area of residence *(Ref.: North)*												
Center	0.958	0.045	1.135***	0.047	0.804***	0.031	0.656***	0.025	0.805***	0.030	0.958	0.038
South & Islands	1.133***	0.042	1.983***	0.069	1.062***	0.034	0.847***	0.027	1.128***	0.036	1.462***	0.049
Constant	2.163***	0.139	1.078	0.078	1.595***	0.108	0.405***	0.028	0.991	0.069	0.588***	0.048
	N = 32,123		N = 31,907		N = 37,099		N = 43,074		N = 35,512		N = 33,976	
	Pseudo-R^2 = 0.0482		Pseudo-R^2 = 0.0885		Pseudo-R^2 = 0.0781		Pseudo-R^2 = 0.1583		Pseudo-R^2 = 0.0453		Pseudo-R^2 = 0.1101	

Note: *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table A6 – Complete models for estimates reported in figure 5 and 6 (logit parameters, OLS parameters and robust standard errors).

	Upper class				Upper class (CV)			
	Model 1		Model 2		Model 1		Model 2	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
Parental education (Ref.: Both tertiary)								
One tertiary	-0.045*	0.027	-0.020	0.027	0.042	0.039	0.010	0.040
One diploma	-0.124***	0.024	-0.051**	0.024	0.096***	0.036	0.006	0.036
Both lower secondary or less	-0.151***	0.024	-0.048**	0.024	0.164***	0.036	0.040	0.036
Year of graduation (Ref.: 1995)								
1998	-0.264***	0.032	-0.261***	0.032	0.721***	0.044	0.718***	0.044
2001	-0.213***	0.031	-0.200***	0.031	0.292***	0.042	0.278***	0.042
2004	-0.008	0.033	-0.007	0.033	0.542***	0.045	0.544***	0.045
2007	0.120***	0.028	0.137***	0.028	0.476***	0.040	0.455***	0.040
Parental education*year								
One tertiary*1998	-0.018	0.041	-0.008	0.041	0.041	0.056	0.026	0.056
One tertiary*2001	-0.039	0.041	-0.036	0.040	0.047	0.055	0.042	0.055
One tertiary*2004	-0.055	0.043	-0.042	0.043	-0.002	0.058	-0.021	0.057
One tertiary*2007	-0.057	0.035	-0.051	0.035	0.114**	0.051	0.108**	0.051
One diploma*1998	-0.110***	0.037	-0.105***	0.036	0.148***	0.050	0.140**	0.050
One diploma*2001	-0.134***	0.036	-0.136***	0.036	0.137**	0.048	0.138***	0.048
One diploma*2004	-0.126***	0.038	-0.111***	0.037	0.131**	0.052	0.109**	0.051
One diploma*2007	-0.143***	0.031	-0.138***	0.031	0.253***	0.044	0.246***	0.044
Both lower secondary or less*1998	-0.134***	0.037	-0.127***	0.036	0.170***	0.050	0.159***	0.050
Both lower secondary or less*2001	-0.139***	0.036	-0.142***	0.036	0.135**	0.048	0.137**	0.048
Both lower secondary or less*2004	-0.152***	0.038	-0.137***	0.038	0.107**	0.052	0.086*	0.052
Both lower secondary or less*2007	-0.221***	0.031	-0.213***	0.031	0.319***	0.045	0.313	0.045
Sex (Ref.: Female)								
Male	0.652***	0.007	0.618***	0.008	-1.177***	0.008	-1.128***	0.009
Geographic area of residence (Ref.: (North)								
Center	0.188***	0.009	0.167***	0.009	-0.382***	0.011	-0.355***	0.011
South and Islands	0.486***	0.008	0.465***	0.008	-0.612***	0.011	-0.584***	0.010
Type of degree (Ref.: Unique-cycle)								
Master	-0.437***	0.015	-0.453***	0.015	0.268***	0.020	0.295***	0.020
Bachelor	-0.993***	0.013	-0.960***	0.013	0.400***	0.020	0.357***	0.020
High school track (Ref. Technical/vocational school)								
Scientific lyceum			0.067***	0.009			-0.063***	0.011
Classical lyceum			0.238***	0.011			-0.277***	0.014
Humanistic schools			-0.385***	0.015			0.443***	0.018
High school mark			0.003***	0.000			-0.006***	0.001
Constant	-1.311***	0.022	-1.561***	0.035	2.822***	0.032	3.199***	0.046
	Deviance = 110738.1		Deviance = 107943.4		R² = 0.266		R² = 0.286	
	N = 118,451		N = 118,451		N = 118,451		N = 118,451	

Note: *** p<0.01, ** p<0.05, * p<0.1

Highlights

- The relationship between parental education and graduation from degree programs with higher occupational pay-offs is investigated
- Five cross-sectional waves of the Italian Graduates Employment Survey (1998-2011) are used
- An increased association between parental education and graduation from remunerative fields of study is found
- After the 'Bologna process', individuals with highly educated parents are increasingly graduating from fields with less uncertain occupational returns

Social background, fields of study and occupational rewards. Changing relationships in an expanding higher education system

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